CDF ANALYSIS ACTION ITEMS FROM JUNE 16, 2014 EPA/LWG CALL

On May 14, 2014, the Lower Willamette Group (LWG) submitted a technical memorandum (LWG 2014) to the U.S. Environmental Protection Agency (EPA), responding to EPA's May 8, 2014 meeting requests for information from the Terminal 4 (T4) confined disposal facility (CDF) Design documents. EPA responded on May 15, 2014 (Sheldrake 2014) with additional questions. LWG and EPA had a conference call on June 16, 2014, to discuss the questions. The purpose of this memorandum is to document responses to those additional questions, which are paraphrased as follows, incorporating the results of the discussion on June 16:

- Provide basis for the CDF sediment treatment technologies evaluated as contingency measures in the 60 percent design
- Provide justification for no effluent discharge during CDF filling and, thus, no need for effluent treatment
- Provide a CDF capacity/alternative volume factor for the T4 CDF
- Discuss assumed air monitoring costs during CDF filling
- Discuss assumed interim closure thin layer sand caps costs
- Discuss research of the Killcohook CDF issue

The remainder of this memorandum discusses these issues.

CDF SEDIMENT TREATMENT TECHNOLOGIES

The T4 CDF, as currently designed, complies with EPA's CDF performance standards, as described in the T4 CDF Design Analysis Report (DAR; Anchor QEA 2011). In addition, a number of contingency measures were evaluated that could be implemented if it is determined these measures are needed; these are described in Section 5.11 (Contingency Planning Measures) of the T4 CDF DAR. If determined to be necessary, all of the contingency measures evaluated could likely be implemented within the +50/-30 percent level of accuracy for a feasibility-level cost estimate. It should be noted that no such contingency measures have been necessary to implement at any existing and functioning CDF's in the Pacific Northwest.

Two of the contingency measures involved sediment treatment with granular activated carbon (GAC) to reduce contaminant leachability and mobility. The first option would be to amend the dredged sediment during placement (i.e., prior to or during pumping into the CDF), and the second option would be to construct a permeable reactive barrier (PRB) containing GAC in the center of the CDF berm with wing wall extensions, as needed, to capture lateral groundwater migration. A distinct advantage of the PRB option is that this contingency measure could be implemented retroactively after the CDF is built and with the benefit of a post-construction monitoring record to assess the performance of the CDF.

For each of the two sediment treatment options, the appropriate GAC mixtures were determined through iterative simulations of the T4 groundwater contaminant transport model (MODFLOW/MT3D). The goal of the model simulations was to maintain polychlorinated biphenyl concentrations in the porewater at the berm face below fish consumption criteria in perpetuity, assuming no biodegradation, which is an extremely conservative scenario. Conceptual costs were developed for the two treatment options to assess their cost effectiveness. The conceptual costs and environmental protectiveness of these and other contingency measures are summarized in the table on page 76 of the T4 CDF DAR.

Through model iterations, it was determined that both of the treatment options would achieve the extremely conservative modeling target with the addition of 0.1 percent GAC. However, amending the dredged material during placement is logistically more challenging due to the large volume of material that would need to be processed and the variability in the physical and chemical properties of the incoming material. Although both treatment options are predicted to result in similar levels of environmental protectiveness (i.e., similarly low concentrations exiting the berm), the cost of amending dredged material during placement is nearly ten times higher than the cost of a PRB wall ($16 million versus $1.8 million, respectively). Therefore, amending dredged material during placement is not cost effective.

CDF EFFLUENT WATER TREATMENT

Treatment of effluent return water during CDF filling will not be required because effluent discharge is not anticipated. Hydraulic dredging and filling of the CDF is assumed to be infeasible given that most of the areas of potential concern (AOPCs) are located a long distance from T4 and many are on the opposite bank of the river, which would present a navigation hazard (see Section 6.3.3 of the T4 CDF DAR). It is expected that sediments would be mechanically dredged and barged to the CDF, and the barged material would be either mechanically transferred over the berm or hydraulically transferred with a high-solids pump using CDF pond water as make-up water. Therefore, the only rise in the pond level would be caused by direct displacement of the pond water by the dredged material.

The top of the CDF berm crest (as well as the elevation of the surrounding land surface) is at approximately elevation 33 feet National Geodetic Vertical Datum (NGVD). The top of the CDF pond is anticipated to be between 7 to 9 feet NGVD during filling. Therefore, the CDF provides at least 24 feet of freeboard capacity between the pond level and the berm crest.

Offloading of dredged material at the T4 CDF is the rate-limiting step for filling the CDF, irrespective of dredging production rates in the Portland Harbor. The offloading rate is anticipated to range between 2,000 and 4,000 cubic yards per day (cy/day). Given the footprint of the CDF (approximately 14 acres), this offloading rate would result in a rise of the CDF pond level of 1 to 2 inches per day. This rise is less than 1 percent of the available freeboard capacity and, therefore, would not result in any overflow.

Schroeder and Gustavson (2013) presented a more aggressive production rate to be assumed for the Feasibility Study (FS). They recommended that with a work schedule of 6 days at 24 hours per day with three dredge plants on site, a rate of approximately 5,600 cy/day could be attained.

This production rate would result in an annual rate of 560,000 cubic yards per year (cy/year). LWG (2014) felt that this production rate was overly aggressive based on site-specific information but would include it in a sensitivity analysis. EPA's proposed rate would exceed the upper offloading rate range estimated by the Port of Portland for the T4 CDF. Thus, with the more aggressive dredging production rate assumptions, the offloading would still be the rate limiting step, with a maximum disposal rate of 400,000 cy/year. Even at EPA's suggested higher removal rate (5,600 cy/day), the displacement would be roughly 3 inches of pond water. This daily pond level rise would also be significantly smaller than the 24 or more feet of freeboard capacity.

As stated in the T4 CDF DAR, if hydraulic dredging is determined to be a practicable and cost-effective alternative for a particular AOPC in Portland Harbor such that overflow and effluent discharge are predicted to occur, additional design information would need to be developed to support this filling method, potentially including modified elutriate tests, column settling tests, and a mixing zone study. If a hydraulic dredging site is identified (none are currently being contemplated), the cost and feasibility of effluent treatment could be considered at that time.

CDF CAPACITY/ALTERNATIVE VOLUME FACTOR

EPA requested LWG use a factor (i.e., a ratio of alternative dredge volume to CDF capacity) for determining when the T4 CDF would be evaluated as an option under any given revised FS alternative. EPA suggested an alternative volume/CDF capacity factor of 1.5 to ensure there would be sufficient sediment dredge volume to fill a potential CDF at T4. EPA further clarified this request as being an initial step to assign a potential CDF to various potential FS alternatives.

In reviewing the T4 CDF capacity and potential dredge volumes from the alternatives in the draft FS, using a removal volume that exceeds a CDF capacity volume by 1.5 results in similar T4 CDF assignments, as presented in the draft Portland Harbor FS (Anchor QEA 2012). Specifically, the draft FS assigned a T4 CDF to alternatives C-r, D-r, E-r, F-i, and F-r. Using an alternative volume/CDF capacity factor of 1.5 assigns a CDF to alternatives D-r, E-i, E-r, F-i, and F-r. The differences between the draft FS approach and a capacity/dredged volume factor were for remedy alternatives C-r (CDF was assigned in the draft FS) and E-i (CDF was not assigned in the draft FS).

In conducting this comparison, a CDF capacity of 870,000 cubic yards (cy) of sediments was assumed for the T4 CDF, which includes a 20 percent consolidation factor. The total dredged volumes used for the comparison were from the remedy alternatives presented in the draft FS. If the dredge volumes change among the alternatives or the consolidation factor is modified for the CDF capacity, then these results may change. However, such modifications are not anticipated to significantly change the current results.

Given the similar results, the LWG agrees to use a 1.5 CDF alternative volume/CDF capacity factor as an initial step to assign a T4 CDF to a remedy alternative for an FS evaluation. However, it is important to note that there are many additional factors beyond simple volume considerations that influence the decision of whether or not to sponsor a CDF as part of a harbor-wide remedy. The following are several factors that have been provided previously by potential sponsors:

- EPA must select a CDF in the Record of Decision (ROD) in accordance with the National Contingency Plan (NCP), and the ROD must determine that other sediment from the site can be disposed of in the CDF.
- A CDF must be demonstrated to be a cost-effective option when compared to other harbor-wide alternatives.
- Other users of a CDF are identified to assist in the significant capital costs to construct such a facility.

AIR MONITORING COSTS DURING CDF FILLING

Air quality is not expected to pose any significant risk to site workers or the community because the dredged material will be handled in a wet state, the CDF pond will be covered with water, and contaminants of concern in Portland Harbor sediments are generally non-volatile. Air monitoring requirements will be addressed in the Contractor's Health and Safety Plan (HASP) as part of the remedial construction documents. Nevertheless, air monitoring will likely be conducted during filling of the T4 CDF. Consistent with the T4 Interim Removal Action conducted in 2008, the Contractor will be expected to monitor air quality for dust and volatile gases in response to visual or olfactory evidence of air quality impacts.

Air monitoring costs are estimated at approximately $10,000 per year, assuming one Contractor staff person devotes 40 hours per month to air monitoring over a 4-month filling season. Assuming the contaminated portion of the CDF is filled in 4 years, and adding $10,000 for HASP preparation and reporting, the total cost of air monitoring is estimated at $50,000. These costs are approximately 0.1 percent of the total estimated cost of the T4 CDF and, therefore, are well within acceptable ranges for FS-level cost estimates.

INTERIM CLOSURE THIN-LAYER SAND CAP COSTS

Section 5.10.5 of the Prefinal 60 Percent T4 design document (Anchor QEA 2011) outlines the interim wildlife protection measure to be taken during the latter stages of filling when the water depth above the contaminated sediments is shallow enough to pose a potential risk to wildlife, primarily piscivorous birds. During the initial part of the filling operation, protection measures will not be necessary due to the significant water depths over the sediment and the initial removal of fish from the CDF during berm closure. Further details on placement of interim covers will be developed as part of the 100 percent design submittal. Conceptually, the interim cover is assumed to be a thin (less than 6-inch) layer of uncontaminated sandy material over the dredged sediment.

EPA has requested that the LWG evaluate the cost of an interim cover and evaluate if the cost is within the contingency of the current cost estimate. Assuming a placement area of 14 acres and a thickness of 6 inches produces a quantity of 11,300 cy or 18,000 tons. The cover material will either be non-contaminated dredged material or imported upland fill placed using the same hydraulic system that offloads the haul barges. The 60 percent design engineering unit cost estimate for non-contaminated fill ranged from $2 per cy for dredged material to $18 per ton for upland fill. Therefore, the cost of one interim wildlife protection cover would range from $23,000 to $325,000 to construct. The thin cover is anticipated to be needed for only one or two seasons. These costs would be less than one percent of the total project cost and, therefore, are well within the FS contingency.

It should be noted that no such interim closure measures have been used during the filling of past CDF's in the Pacific Northwest.

KILLCOHOOK CDF ISSUE

On May 13, 2014, KOIN 6 produced a story on the T4 CDF (KOIN 6 2014). In that story, KOIN 6 referenced a "failure" of the Killcohook CDF. Subsequent research into the Killcohook CDF (Depasquale 2010; New Jersey DEP 2010) determined the following facts about this incident:

- The Killcohook CDF is an upland CDF located on the Delaware River. A portion of the CDF is in the state of Delaware with the remainder in New Jersey.
- The dredging project was part of the 45-foot Delaware River Navigation Channel deepening. The U.S. Army Corps of Engineers (USACE) had approval to discharge dredge material from this project into the cells of the CDF located in the state of Delaware but not the cells located in New Jersey.
- The deepening project had more dredged material than anticipated. During filling, USACE decided to place the excess material into the New Jersey cell. The cell that was filled with extra material has two sluices that convey return waters to the Delaware River, with one discharging to the waters of the New Jersey and one to the waters of Delaware. USACE wanted to only discharge to the waters of Delaware, so it constructed an internal dike within the cell that precluded any water from entering the sluice that discharges into New Jersey waters.
- During the filling process, the internal dike was undermined with the dredged material slurry causing the dike to fail. Water then spread into the entire cell reaching the sluice that discharges to New Jersey.
- It was always intended that the effluent return water from the Killcohook CDF would be discharged to the Delaware River. The dispute concerns where the discharge occurred and in what state.

The Killcohook CDF had a number of elements that are fundamentally different than the T4 CDF, which makes the comparison of the two structures inappropriate. Significant differences include the following:

- These are two different types of CDFs. The Killcohook CDF is an upland CDF; the T4 CDF is a nearshore CDF.
- The filling process for the two CDFs is significantly different. The Killcohook CDF was filled hydraulically directly from the dredging site; the T4 CDF will be filled by offloading barges. The material will be discharged at the water surface or just below in

the T4 CDF, whereas the Killcohook CDF was discharged on grade. Discharging the dredged material into the water column away from the berm will eliminate the possibility of the T4 containment berm being eroded and undermined. In addition, the training dikes used for the T4 containment berm construction will provide a layer of armoring on the berm face, which will resist erosive forces during filling.

- The Killcohook CDF was designed to manage large volumes of navigational dredged material, not a contaminated sediment remediation project.
- The structure of the two CDFs is different. The Killcohook CDF used internal dikes, while the T4 CDF will not have an internal dike.
- Killcohook CDF was designed to discharge return water to receiving water (via a sluice). The T4 CDF will not discharge to the Willamette River.

In conclusion, the events that caused the Killcohook internal dike failure will not occur at the T4 CDF. The CDF location, design, nature of the dredged material, method of filling, and management of effluent water at Killcohook are in no way analogous or representative of the conditions at T4.

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